

**Report from the American Society of Cinematographers Technology Committee**  
Curtis Clark, David Reisner, David Stump, Ron Garcia, Lou Levinson, Al Barton,  
Ron Burdett, Bill Feightner, Gary Demos, Don Eklund, Eric Rodli, Steve Schklair,  
Garrett Smith, John Scheele and David Morin

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# Report from the American Society of Cinematographers Technology Committee

By: Curtis Clark, ASC; David Reisner; David Stump, ASC; Ron Garcia, ASC; Lou Levinson; Al Barton; Ron Burdett; Bill Feightner; Gary Demos; Don Eklund; Eric Rodli; Steve Schklair; Garrett Smith; John Scheele; David Morin

(Affiliations (as requested): David Reisner, D-Cinema Consulting)

## ASC Technology Committee Officers

**Chair:** Curtis Clark, ASC

**Vice-Chair:** Richard Edlund, ASC

**Vice-Chair:** Steven Poster, ASC

**Secretary:** David Reisner

## Introduction

ASC Technology Committee Chair: Curtis Clark, ASC

*From its inception in 2003, the ASC Technology Committee has been guided by its primary mission to engage and influence motion imaging technology developments in ways that better serve and protect the filmmaker's creative intent and the role of the cinematographer in realizing a creative vision.*

*Since our last report in September 2012, very constructive ongoing work has been done by our ASC Technology Committee and subcommittees that follow through with the excellent work that was accomplished between September 2011 and September 2012. Significant advances that were being made regarding on-set/near-set workflow for look and data management of digital camera images dominated the content of our 2012 report. 4K spatial resolution derived from camera RAW was beginning to make its mark, but the broader implication of its creative significance was only just starting to be understood. With greater practical experience gained from using 4K cameras (especially the Sony F65 and Sony F55) for both theatrical motion picture and TV scripted drama production, the superior imaging attributes of greater bit depth, wide color gamut and 4K using ACES (the Academy of Motion Picture Arts and Sciences (AMPAS) Academy Color Encoding System) color management, have become increasingly clear.*

## Creative Importance of 4K Spatial Resolution

From a creative perspective, greater spatial resolution (e.g., 4K) is a vital component of a creatively enhanced digital motion imaging canvas that also needs to include wide-gamut color with increased color bit-depth, e.g., 16-bit, along with the ability to reproduce a high dynamic range of scene tones consisting of at least 14 stops. The fusion of 4K spatial resolution with 16-bit wide-gamut color and high dynamic range produces a superadditive synergy where the resulting effect is greater than the simple sum of each component's effect on its own.

The ability to reproduce more finely resolved (4K) image detail can now take full creative advantage of increased color bit-depth code values (e.g., 65,000+ CVs for 16-bit) to reproduce more nuanced color and tonal contrast. Working in ACES both preserves 16-bit wide-gamut color from camera RAW and facilitates greater preci-

sion in the color grading. Even though many current projectors and monitors display only 10 bits, preserving 16-bit wide-gamut color in the ACES master effectively preserves the creative content for future display devices that will be able to display greater bit-depth images containing significantly improved contrast, along with higher resolution and increased image brightness.

Another crucial advance regarding the importance of 4K is the ability (and need) to differentiate the effect of greater spatial resolution from image sharpness. Unfortunately, resolution and sharpness are frequently and mistakenly conflated. As the latest generation of 4K digital motion picture cameras move beyond the constraints of HD (1920 x 1080) spatial resolution, we can leave behind the HD video camera imaging parameters, which invariably incorporate degrees of electronic image sharpening that are intimately associated with a video look. The latest digital motion picture cameras, for example the F65 and F55, rely primarily on greater spatial resolution and tonal contrast as does film. This can facilitate a more filmic look for the digital camera image. Of course, camera lens selection is equally vital regarding resolution and contrast, as the apparent photographic sharpness of the image is ultimately dependent on lens performance and accurate lens focus at the camera focal plane.

In summary, 4K spatial resolution (without artificially enhanced electronic image sharpening), along with wide-gamut color with greater bit-depth, enables the digital motion picture camera to obtain a more filmic look, especially using ACES color encoding. This perspective is vital for motion pictures made for theatrical release, but also very relevant for scripted TV dramas. It is also important for the future UHDTV and the upcoming new 4K Blu-ray standards.

Our new UHDTV subcommittee chaired by Don Eklund is proactively addressing the consequences of 4K UHDTV (quad HD) and the next generation Blu-ray standard, as well as the next generation 4K display devices.

Our Motion Imaging Workflow subcommittee, co-chaired by Al Barton, Ron Burdett, and Bill Feightner, is applying the lessons being learned from our on-set/near-set testing with ACES color encoding to create a set of best practice workflow recommendations.

Our new Laser Projection subcommittee, co-chaired by Eric Rodli and Steve Schklair, is addressing the next-generation laser projection.

We also have important reports from our Advanced Imaging subcommittee, chaired by Gary Demos, vice-chaired by Jim Fancher and Phil Feiner; our Virtual Production Committee, chaired by David Morin and co-chaired by John Scheele; reports from our Camera and Metadata subcommittees, chaired by David Stump, ASC; and our Enlightenment subcommittee, chaired by Ron Garcia, ASC.

Special mention should be given to the work of our Digital Finishing (formerly Digital Intermediate) subcommittee, chaired by Lou Levinson and vice-chaired by Josh Pines with David Reisner serving as secretary. We are the proud recipients of a 2012 Primetime Emmy Engineering Award for our ASC CDL. We are also proud to have been

proactive contributors to the success of ACES, which was also given a 2012 Primetime Emmy Engineering Award received by AMPAS.

## Camera Subcommittee

**Chair:** David Stump, ASC

**Vice-Chair:** Richard Edlund, ASC

The ASC Technology Committee Camera subcommittee was actively involved in designing, planning, and shooting the ASC-PGA Image Control Assessment Series (ICAS). The Camera subcommittee has also been working with the SMPTE 21DC Higher Frame Rates Study Group to design appropriate higher frame rate (60, 100, 120 frames/sec) test and demonstration material.

4K imaging, especially when accompanied by wide dynamic range and wide color space, provides a meaningfully improved palette for the cinematographer and allows for a meaningfully improved audience experience. ICAS was shot, post-produced, and presented in 4K. This year seems to have been an industry tipping point in the adoption and proliferation of 4K. 4K is rapidly becoming the default assumption for new cameras and for feature-level post-production. “4K” has also become a default for marketing and spec sheets, requiring some careful evaluation by potential buyers.

The Camera subcommittee is presently working with the recently formed UHD TV subcommittee, exploring the issues of color space encoding, compression codecs, and bit rates, and with AMPAS on the ACES RRT work.

The subcommittee is working with the European Federation of Cinematography Societies (IMAGO) to actively include Europe in the work being done in Hollywood and to ensure collaboration and investment in the work.

### The Image Control Assessment Series (ICAS)

In 2009, to help understand and characterize the behavior of the first crop of potential Digital Cinema cameras, the American Society of Cinematographers (ASC) and the Producers Guild of America (PGA) shot the Camera Assessment Series (CAS). Partly as a result of what was learned from the 2009 CAS, partly as a result of continued vendor feedback from the ASC Technology Committee Camera subcommittee, from additional experience using digital cameras to make motion pictures, and from the continued march and development of digital technologies a new crop of cameras was developed and released. In 2012, the ASC decided to do another Camera Assessment to accommodate these numerous new cameras. Recognizing that a camera exists and performs as part of an imaging workflow, the “Image Control Assessment Series” (ICAS) was conceived to examine the next generation of digital cinematography cameras and the latest in digital workflow.

More than 150 participants from the PGA, the ASC, Revelations Entertainment and the production community at large converged on the Warner Bros. lot to conduct a two-day shoot for the ICAS. The project incorporated the use of the ACES, aimed at maintaining consistent color throughout post-production through to Digital Intermediate. ICAS used a 4K workflow for output to film and Digital Cinema Package (DCP).

This time the testing encompassed two “cinematic” scenes: “Serious News,” a daytime, harshly lit interior/exterior scene designed to test the contrast range and resolution of each digital camera, and “Cinema Italiano,” a night exterior in the rain that was designed to test each digital camera’s sensitivity, color, contrast range and resolution compared to film.

Each digital cinematography camera was shot in round robin order. Results were shown dual-stimulus against the industry benchmark of film. Cameras tested were the ARRI Alexa Studio, Canon C300, Red Epic, Sony PMW-F3 and Sony F65, as well as an ARRI 435 film camera.

ICAS was finished using an ACES workflow at Sony Colorworks in Culver City. The results were shown at the PGA Produced By conference, at AMPAS, at the ASC in both Los Angeles and New York, and at several conferences internationally. These tests have been greatly informative for cinematographers and for the production community in general.

### High Frame Rates in Cinema

Film cameras have historically used a frame rate of 24 frames/sec with 180 degree shutter angle, which yields an exposure time of 50% of 1/24th of a second = 1/48th of a second. In subject matter where there is fast lateral motion or when the camera pans quickly, the resulting images can strobe, which is distracting to viewers and can reduce the realism of a scene. The apparent motion looks like rapidly flashing images instead of a continuous motion. Additionally, when viewing stereoscopic 3D imagery, this “strobing” effect caused by fast motion may weaken or distort the perception of stereoscopic depth. The proposed use of higher frame rates is an attempt by the creative community to greatly reduce and mitigate strobing effects. The notion of using higher frame rates such as 48 frames/sec or 60 frames/sec has been met with considerable resistance on a multitude of grounds, and it has become clear that any proposed increase in acquisition frame rates deserves some serious scientific evaluation.

The ASC Technology Committee Camera subcommittee has actively participated with SMPTE in crafting a test plan in the area of high frame rates. The plan was constructed to use a number of current generation cameras including Arri Alexa, Red Epic, and Sony F65. The high-frame-rate test-shoot plan describes setups of scene and camera that will acquire images to assist evaluation of the following criteria:

- JPEG 2000 compression bit rate vs. image quality tradeoffs.
- Different frame rate and shutter angle combinations to allow exploration of image sharpness, motion portrayal, and strobing effects on viewer perception.
- Evaluation of state-of-the-art digital cameras capable of high frame rate acquisition.
- 3D imagery perceptual issues including eye-strain, miniaturization vs. gigantism, compaction vs. elongation (roundness), and weak vs. strong 3D depth effects.

The scenes may also help evaluate viewer preferences on a variety of demanding material.



"Serious News" wide shot from ICAS tests.



"Cinema Italiano" wide shot from ICAS tests.

### Digital Finishing Subcommittee

**Chair:** Lou Levinson

**Vice-chair:** Joshua Pines

**Secretary:** David Reisner

This has been a year in which the industry has evolved and changed at a pace that outstrips any time in recent memory. I would like to take a moment to thank all who participated in our subcommittee's activities. We know there are times when the participants in an all-volunteer army have to pay attention to the home front, and the current pace of change makes it especially hard. On behalf of the ASC, we extend a heartfelt thanks to all.

Nevertheless, our accomplishments have been recognized by the Academy of Television Arts and Sciences, which awarded a Primetime Emmy Engineering Award to the ASC for the ASC CDL. The entire ASC Technology Committee deserves to "pat itself on the back" for a job well done. The ASC CDL will soon move to version 1.3, and hopefully in the very near future, SMPTE will accord it the heft of being a Recommended Practice. The ASC CDL has been very widely adopted. It is now so commonly used that it is difficult to track. Major post facilities report use at some point(s) in the workflow of 80 to 90% of feature motion pictures, and similar rates of use in television. Reports are that use in VFX turnover is at least as high. Again, well done to all who have participated over the years.

The subcommittee as a whole, as well as individual members are involved in the intricate task of bringing the Academy of Motion Picture Arts and Science's ACES workflow into our world, and extend the idea of cross-platform and cross-facility compatibility from on-set to global deliverables. While this endeavor seems a

large task at this point in time, we all recognize that the rewards for seeing this through will be commensurate with the energy we are expending on the ACES project. ACES, if anything can, should reduce the number and kinds of different "snowflake" workflows for the ever-increasing project complexity.

In the interest of keeping up with our rapidly changing environment, we are suggesting that the name of the subcommittee be changed from DI to Digital Finishing because it has been a while since the current digital workflows were "intermediate" steps.

In the future, we anticipate that the world will continue to change at an ever increasing pace, and the DI/Digital Finishing subcommittee of the ASC Technology Committee will be on hand to advance the art and understanding of visual storytelling, regardless of resolution and frame rates.

To get the current ASC CDL specification, send an e-mail to [asc-dl@theasc.com](mailto:asc-dl@theasc.com); an auto-responder will send terms and instructions. For additional information about the ASC CDL or Digital Finishing subcommittee, contact Joshua Pines at [jzp@technicolor.com](mailto:jzp@technicolor.com), Lou Levinson at [joe.beats@yahoo.com](mailto:joe.beats@yahoo.com), or David Reisner at [dreisner@d-cinema.us](mailto:dreisner@d-cinema.us).

### Motion Imaging Workflow Subcommittee

**Co-chair:** Al Barton

**Co-chair:** Ron Burdett

**Co-chair:** Bill Feightner

The ASC continues to aggressively respond to the dynamic and accelerating paradigm shifts, which are aggressively disrupting the traditional motion picture-making process. Trends that have already impacted our personal lives such as the whatever/wherever/whenever model of media consumption, cloud-based data storage and processing, virtual cloud-based applications, and computing going wireless, are now impacting the motion picture process. The distinct separation between production and post-production has given way, with many of the traditional post functions moving to on-set and near-set. Conversely, many traditional on-set functions are extending themselves into post. For example, in many cases the final "look" is only developed during the finishing process with the almost limitless tools available. New workflows and technology are needed to keep the cinematographer involved in this new expanded role. While geographically unlimited, collaboration between the "creative team" throughout the process is as essential in today's world as it has been historically.

Now that the AMPAS ACES is being standardized within SMPTE and used in feature motion picture production, there is a need to show how ACES, along with the ASC CDL, is used in different workflows by documenting "Best Practice" items used throughout the process. The two ASC Technology Committee Workflow subcommittees were working through this process, recognized they were working on similar items, and decided to work together as a joint committee.

The cinematographer, as the "practitioner of the craft" and "keeper of the image" needs to understand the advantages of using ACES and the ASC CDL throughout the process from pre-production to archival and use Best Practices to maintain image quality and consistency.

The purpose of this subcommittee is to create several different documents that will cover the use of ACES and the ASC CDL:

1. An overview of how ACES is used in workflows that can be presented to executives in about 15 minutes. This will be an 80,000 ft view with enough information to understand the advantages of using ACES, without getting bogged down in the gritty details.
2. A set of documents describing Best Practices for using ACES as the encoding system in workflows. These documents will have an initial focus on the on-set and near-set area, since they are the “stake in the ground” point for setting the look of the image. The group will then continue documenting Best Practices that can be used throughout the process to archival.
3. The next documents will help answer questions in much greater technical detail as ACES becomes the de-facto standard used by the industry.

The new generation of digital motion picture cameras is capable of increased dynamic range, wider color gamut and latitude, higher resolution, and increased bit-depth. ACES was created to enable the use of these new attributes. Using ACES in the workflow will also allow for an archive that can be shown in the future and maintain the original creative intent.

Below is a consolidated list, showing areas that will use ACES and the ASC CDL in their process, drawing from the four main phases of production: Pre-Production, Production, Post-Production, and Archival. The focus of the work is not on people, but on the process of using ACES in the workflow.

- Pre-visualization
- Production Design and Art Direction
- Look Management
- VFX Design
- Cinematography (Keeper of the Image)
- Post-Production Supervision
- Dailies
- Editorial
- Data Management
- On-Set Monitoring and Calibration
- Cameras

### Advanced Imaging Subcommittee

**Chair:** Gary Demos

**Vice-chair:** Jim Fancher

**Vice-chair:** Phil Feiner

**Secretary:** David Reinsner

The Advanced Imaging subcommittee has been working on three task areas. First and foremost has been ongoing support of ACES development and testing. Our second task has been to explore and understand interconnects, with the main emphasis being on Quad 3 Gbit/s HD-SDI, DisplayPort 1.2, and HDMI 1.4a. Our third and most recent effort has been to support the newly-formed UHD TV task force under Don Eklund. That work has included exploration of the Dolby Perceptual Quantizer, color space suitability for high-dynamic range, bit-

depth issues, and development of custom Output Device Transforms (ACES ODTs) for high-end UDTVs to explore their full capability.

With ACES achieving broader utilization, there has been significant progress in the correct use of the word “linear” to describe images. ACES uses a linear representation wherein the light energy is in proportion to the pixel value. The widespread erroneous practice of calling a video-gamma “linear” has been on the wane. It is hoped that this confusing error is nearing elimination.

There is a related issue wherein the 2.22 gamma (slope-matched to linear near black) has recently been replaced in International Telecommunications Union (ITU) documents by a more correct 2.40 pure gamma for video gamma. It is hoped that the 2.22 almost-gamma (which was never accurate) will also soon disappear from engineering discussions.

### Metadata Subcommittee

**Chair:** Dave Stump, ASC

Jim Houston

This year the Metadata subcommittee has been focusing on assisting and enhancing metadata work being done by several organizations. The Metadata subcommittee still has a primary role in assisting AMPAS in the definition of metadata content and containers for ACES. The subcommittee has also been working with the Entertainment Technology Center@USC on metadata aspects of several of their projects, including the Production in the Cloud Project.

The subcommittee has also been in active communication with several companies on their metadata work, including Cooke Optics. Cooke's *i* open protocol technology enables film and digital cameras that are *i* equipped to talk to lenses directly via contacts in their lens mounts to record key lens and camera data for every frame shot and provide it to post-production teams digitally. It enables continuous remote readout of focal length, focus distance, f-stop, frame rate and depth-of-field from electronics inside the *i* equipped lens and digitally records vital lens and camera settings synced to Timecode to digital recording medium or to an SD card. Avid Media Composer editing system takes lens metadata captured with *i* and passes it through to VFX and Digital Intermediate.

### UHD TV Subcommittee

**Chair:** Don Eklund

The ASC Technology Committee has agreed to support a subcommittee to explore what methods can best deliver a predictable UHD image on consumer devices and software. The motivation to work on this challenging area is a direct result of observations of the current display and content delivery systems for HD and the desire to improve and simplify the consumer experience for adopters of UHD. A number of the ASC Technology Committee members have substantial depth of understanding of the complexities associated with these studies, most recently exercised in their work on development of ACES. The areas under study include the following:

- Optimum EOTF for delivery of the highest possible contrast with reduced visible quantizing artifacts
  - Can 10 bits per pixel deliver adequate performance?
- Recommended color primaries or color signaling method
  - If gamut is significantly expanded, what is the minimum required coding depth?
- Method to convert expanded gamut and dynamic range signals to acceptable Rec. 709-compatible signal
- Method to adjust picture level and EOTF under varying ambient lighting conditions

To enable these items to be effectively studied, the ASC subcommittee members are actively studying current and future display technology and seeking to obtain sample devices. We are also in the planning phase to create new content that has the raw dynamic range and gamut to satisfy testing requirements for the UHDTV study and other purposes.

While the group has made significant progress in obtaining information from industry sources about the real-world possibilities and challenges associated with these study items, the problems of delivering a new consumer experience in resolution, color, and dynamic range are substantial. Our intention is to use experimentation and published data to identify the best approaches to each problem on an expedited schedule.

Input to the group is welcome, provided that it can be shared on a non-confidential basis. Contact [asc-uhdtv \(at\) d-cinema \(dot\) us](mailto:asc-uhdtv@asc-cinema.us).

### Laser Projection Subcommittee

**Co-chair:** Steve Schklair

**Co-chair:** Eric Rodli

#### Overall Vision of Subcommittee

The ASC Technology Committee would like to influence the motion picture industry to take advantage of the implementation of laser projection as a means to improve the quality of 2D and 3D theatrical display of motion pictures beyond what is capable with Xenon light sources, similar to other efforts by the ASC Technology Committee to support high-quality image standards throughout the digital imaging chain.

#### General Subcommittee Goals

Keep the ASC abreast of the status and latest trends associated with the use of laser illumination for the display of motion pictures with a focus on the impact of laser illumination on image quality within a theatrical environment and the impact and potential implications on capture and post-production.

Additionally, via this subcommittee, the ASC Technology Committee can provide a forum for specific input to the manufacturers of laser projectors and illumination systems regarding desires for the key parameters of image quality, including work on helping the industry define these parameters and measurements of image quality that relate to laser light sources, such as “speckle,” metamorphism, expanded color gamut, etc. The goal of the subcommittee is to also work with key industry participants, such as SMPTE, and with relevant trade associations, such as the Laser Illuminated Projector Association (LIPA), to create the basis for standards and procedures for measurement of image quality from laser projection.

The ASC-DCI StEM footage is recommended by the subcommittee as initial test material to compare laser projection technologies with each other and with Xenon and as the starting point for the determination of key image quality parameters. If needed later, the subcommittee could lead or participate in the creation of new footage that more specifically will allow both subjective and objective judgment of image quality, including 3D content.

#### Status—Initial Education Efforts

The subcommittee arranged for technology executives from RealD to give an industry overview presentation at a main ASC Technology Committee meeting, and arranged invitations to the recent industry demonstration of a Christie high-lumens demonstration system at AMC Burbank Theater.

#### Next Steps

- Create initial “point of view” on the image-quality parameters that specifically relate to laser illumination and their potential implications on current display and upstream content creation workflow and technologies.
- Seek formal relationship with LIPA as potential partner in recommending image quality standards and common measurement philosophy as the first step in Standards creation.
- Expand participation in the subcommittee.

### Digital Archive Subcommittee

**Chair:** Garrett Smith

Since its formation, the Digital Archive Subcommittee has persistently raised awareness of the challenge of digital preservation, along with film-based preservation/restoration.

Recently, many major events have occurred:

Film Origination is rapidly disappearing.

The concept of preserving “Born Digital” films archived on celluloid will soon no longer be a practical option—the Digital Preservation solution is moving from Option to Imperative.

Multiple organizations are focusing on finding solutions—among them are the Association of Moving Image Archivists (AMIA), AMPAS, Library of Congress, and the Studios themselves—to name a few.

The subcommittee will seek critical data on the archival/restoration landscape as it exists today and engage with key stakeholders on the directions they are heading—all with an eye on the effect their proposed solutions have on preserving the filmmaker’s creative intent for future generations. We will report our findings to the ASC Technology Committee and the ASC Membership at large.

Among the subjects to be included in our discussion will be:

- Physical Media Migration (LTO)
- Spinning Disk, Solid State Devices, & Cloud-based Solutions
- Metadata Preservation
- The Role of Compression (None, Mathematically Lossless, Visually Lossless, Lossy)

## Enlightenment Subcommittee

**Chair:** Ron Garcia, ASC

**Co-chair:** John Toll, ASC

The mission of the Enlightenment subcommittee continues to be “making projects and accomplishments of the ASC Technology Committee accessible and comprehensible to the full ASC membership as well as to a wider audience outside the ASC.”

Last year’s focus was to scale down the highly technical description of the ACES system and specifications for our membership. After working on numerous charts trying to describe the process as a linear “workflow,” the subcommittee realized that due to the complex interconnectivity of ACES a three dimensional representation and/or an “interconnectivity map” was necessary instead of a workflow.

Our subcommittee has designed an interactive three dimensional chart and a “nonlinear connective map” as a starting point to our endeavors to describe ACES to the membership and eventually the general public on our ASC website.

We are very excited about publishing these “Interconnectivity Maps” within this year. This committee would like to recognize Tim Kang, Ben Michaels, Lior Molcho, Alex Forsythe, and Jim Houston for their valuable input in the process of creating these “maps.”

Any SMPTE member who would like to contribute or participate in this endeavor can contact Ron Garcia, ASC, at [rongarcia \(at\) earthlink \(dot\) net](mailto:rongarcia@earthlink.net) or [Holly \(at\) theasc \(dot\) com](mailto:Holly@theasc.com).

## Joint Technology Subcommittee on Virtual Production

**Chair:** David Morin

**Co-chair:** John Scheele

The Virtual Production Committee (VPC) continues its series of case studies—presenting work on films and television projects that have advanced the use of new tools and methodology in this area. Next targeted presentations are “White House Down,” which made use of an encoded camera system to plan complex shots on set (Volker Engel & Marc Wiegert, VFX Supervisors) and “Gravity,”

Here are recent events hosted by the VPC:

25 April 2012 FMX Conference: Paradigm Shift—Virtual Production

These topics were presented, and will be part of a new report:

- Today’s Previs—Faster, Smarter and More Versatile  
David Morin (Autodesk), Ron Frankel (Proof)
- Visualizing the World of Disney’s Oz: The Great and Powerful  
Trevor Tuttle (The Third Floor)
- FX: What Is Broken, And What Can Games Do to Fix It?  
Habib Zargarpour (Microsoft Studios)
- Virtual Production in Animation: “The Croods”  
Markus Manninen (DreamWorks)
- From Avatar to Jack and Halo 4: Virtual Production at Giant Studios  
Matthew Madden (Giant Studios)

- From Independent to Blockbuster—Virtual Production for All Budgets  
Nic Hatch (Nvize)
- Unified Workflows for Virtual Production—A Panel Discussion  
Duncan Burbidge (The Third Floor), Graham Jack (Double Negative), Kim Libreri (Lucasfilm), Matthew Madden (Giant Studios), Markus Manninen (DreamWorks), Trevor Tuttle (The Third Floor)

Still posted from FMX 2012 is an extensive video recording of the track on Virtual Production, featuring Doug Trumbull, Rob Legato, Alex McDowell, Erik Nash, Glenn Derry and many others:

<http://area.autodesk.com/fmx2012>

Please view in the sequence below:

FMX2012 Virtual Production Opening Keynote

FMX2012 Virtual Production Opening Panel

FMX2012 Upside Down Worldbuilding for Independent movies

FMX2012 Design for Virtual Production: Avatar, Tintin and beyond

FMX2012 Upside Down Worldbuilding for Independent movies Q&A

FMX2012 Virtual Production in Television

FMX2012 Virtual Production in Games

FMX2012 Virtual Production of Real Steel

FMX2012 Virtual Production of Hugo

FMX2012 Virtual Production Panel: Animation Converges with Live Action

FMX 2012 Virtual Production—System Engineering for Virtual Production Panel: The Future of Virtual Production

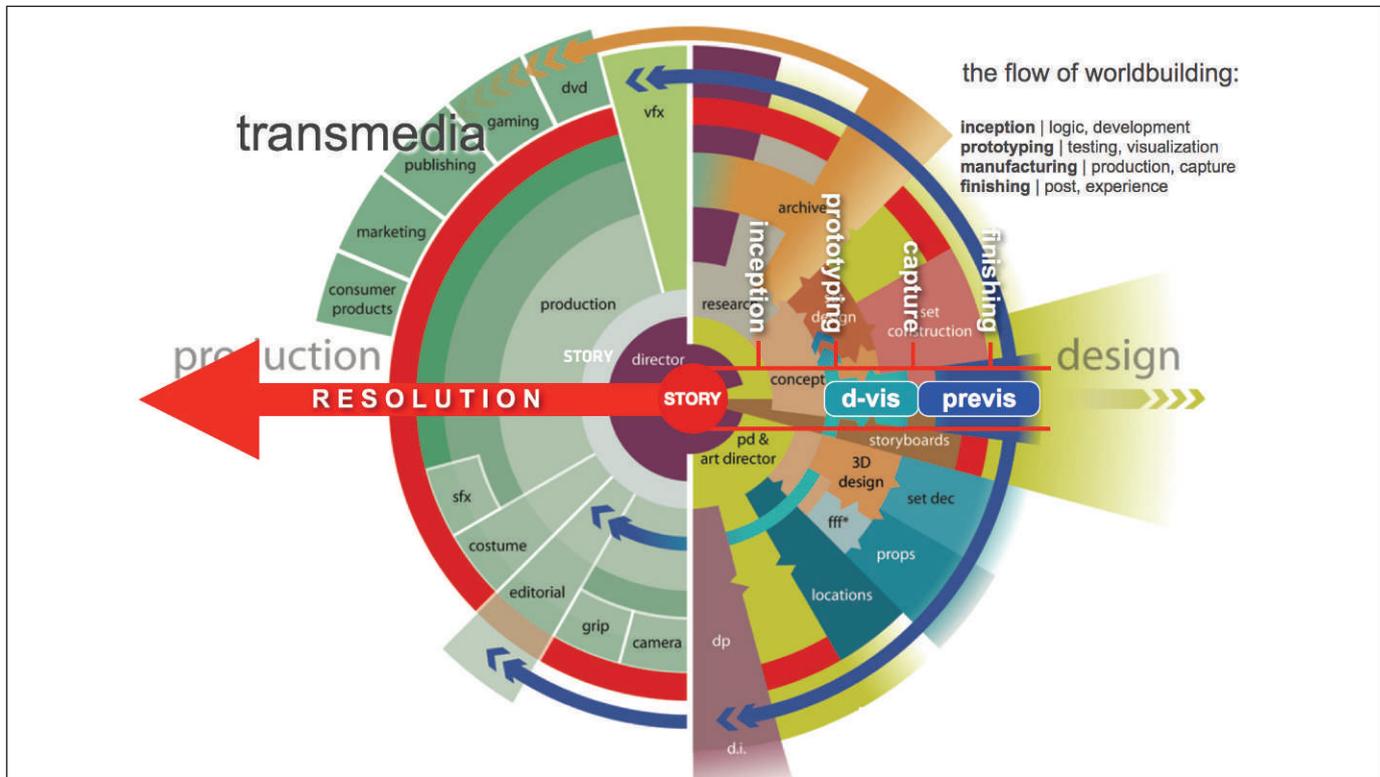
On 13 February 2013, Joe Letteri presented Weta’s work on *The Hobbit: An Unexpected Journey*. Pending the published report, Dave Trumbore has posted an excellent summary of the event on [collider.com](http://collider.com/the-hobbit-visual-effects-joe-letteri/): <http://collider.com/the-hobbit-visual-effects-joe-letteri/>.

The 15 November 2012, VPC event at Universal Studio Virtual Stage 1 (UVS1) focused on virtual production for episodic television, with Andrew Orloff, creative director, visual effects supervisor and founder of Zoic Studios. Orloff and his colleagues presented Zoic’s recent virtual production work on *Once Upon a Time*, along with a live demonstration of the virtual sets currently used in production in Vancouver. Yuri Neyman, ASC, also spoke about his new school and curriculum at Global Cinematography Institute, along with famed cinematographer Vilmos Zsigmond, ASC.

Other events in 2012 included presentations on *Total Recall* and *The Adventures of Tintin*.

## Definitions and Workgroups

As a starting point, virtual production was narrowly defined as computer graphics on stage, or the process of shooting a movie with realtime computer graphics, either for all-CG movies (such as *A Christmas Carol* or *Tintin*) or visual effects movie with live action (such as *Avatar* or *Real Steel*).



Virtual production is a collaborative and interactive digital filmmaking process, which begins with virtual design and digital asset development and continues in an iterative, nonlinear process throughout the production. This is a Digital Mandala representation created by Alex McDowell/5D Institute.

This definition has evolved over time, and is currently expressed more broadly: Virtual production is a collaborative and interactive digital filmmaking process, which begins with Virtual Design and digital asset development and continues in an iterative, nonlinear process throughout the production.

The Joint Technology Subcommittee on Virtual Production (VPC) links representatives of the ASC, ADG, VES, PGA, ICG and Previsualization Society.

There is an ongoing Definition Workgroup, Publications Workgroup, History Workgroup and others may be created, when there is demand. Participation is encouraged. Those interested may contact:

David Morin, Chair, davidmorin@davidmorin.com

John Scheele, Co-Chair, johnscheele@gmail.com

Inquires regarding the ASC Technology Committee should be sent to Holly Lowzik: (at) theasc (dot) com.



**Curtis Clark**, ASC, studied theater at the Art Institute of Chicago's Goodman School of Drama and cinematography at the London Film School. He began his career by shooting numerous documentary films in Britain before transitioning to shooting feature films. Following on the success of his short film, *The Arrival*, Clark recently completed his highly praised short film *Eldorado*.

A member of the ASC Board of Governors, Clark is chairman of the ASC Technology Committee. Since its inception in 2003, the Committee under Clark's leadership has achieved a series of notable successes including its collaborative work with Digital Cinema Initiatives, LLC (DCI) to produce standardized evaluation material for

assessing the performance of digital projectors and other elements of DCI standards-based digital cinema systems.

The ASC Technology Committee, at Clark's instigation, embarked on the development of a groundbreaking project to create cross platform data exchange for primary RGB digital color correction referred to as the ASC CDL (Color Decision List). The ASC CDL was recognized by the Academy of Television Arts and Sciences with a prestigious 2012 Prime Time Emmy Engineering Award.



**David Reisner** uses his industry-leading expertise in motion picture image quality, color, workflow, Digital Intermediate (DI), and digital imaging in production, post-production, and exhibition to defend creative flexibility and create best practices.

He was a principal in creating the ASC Color Decision List (ASC CDL), now used in the production of about 80% of feature motion pictures. Reisner was also a principal in creation/design of the ASC-PGA Camera

Assessment Series, the ASC-DCI StEM (Standard Evaluation Material) test movie, and the ISDCF 3D luminance demonstration. He was vice-chair of the SMPTE working groups that drafted the key digital cinema image standards, and a member of the AMPAS ACES working groups.

Reisner is founding secretary of the ASC Technology Committee, an ASC associate member, and an active Member of the Visual Effects Society.

Reisner designed one of the first digital music synthesizers, the first VLIW CPU, the first popular portable video player, an early Internet music and movie distribution service, and co-designed the first lightweight portable computer. He has trained killer whales and shot magazine covers and book jackets.



**David Stump**, ASC, has worked on numerous motion pictures and television productions as director of photography, as visual effects director of photography, as visual effects supervisor, and as stereographer, (including both live action work and 2D to 3D conversion work), earning an Emmy Award, an Academy Award for Scientific and Technical Achievement and an International Cinematographers

Guild Award. His credits include such high profile projects as *The Last Stand*, *Immortals*, *Flight Plan*, *Fantastic Four*, *X-Men 1 & 2*, *Into the Blue*, *Red Riding Hood*, *Garfield*, *Batman Forever*, *Hollow Man*, *Men of Honor*, *Deep Blue Sea*, *Stuart Little*, *Contact*, *Batman & Robin*, *Mars Attacks*, *Executive Decision*, *Stargate*, and *Free Willy*, among many others.

Stump currently serves on the AMPAS' Science and Technology Council. He also serves as co-chair of a SMPTE study group on High Frame Rate for Digital Cinema.



**Ron Garcia**, ASC, is a Life member of SMPTE and is the inventor of a Film Calibration system used to control color management in film-to-tape transfers and film recorders. Garcia is a member of the Academy of Television Arts and Science, the Academy of Motion Picture Arts and Sciences, and a committee member of the Academy Sci-Tech Awards in 2008. He has been a member of the American Society of Cinematographers since 1994.



**Lou Levinson** received an MFA from the School of the Art Institute of Chicago in 1979, having worked his way through school as a tape operator and colorist. After graduating, he worked at Columbia Pictures Videocassette services, where he helped to maintain the first flying spot scanner installed in the midwest. In September 1980, he was hired as a colorist at Modern VideoFilm (MVF), becoming the 13th employee there. Thirteen years later, he

left to join colorist the MCA/MEI Telecine Research Center as a colorist, working in what was the third HD telecine room in the world. From 1998 to 2008, Levinson worked as a senior colorist at Post Logic Studios. From 2008 to 2012, he was a supervising colorist at Kodak-Laser Pacific/HIG/Technicolor. He is currently a consultant and free-lance colorist. A longtime ASC Associate Member, he has been on the ASC Technology Committee since its inception and is currently chair of the Digital Intermediate/Finishing subcommittee.



**Al Barton** has spent 29 years as a technologist in production, post-production, and manufacturing for television and feature films. Most recently he worked in production/post-production and distribution of feature films for Sony Pictures. Barton has participated in the International Organization for Standardization (ISO), the International Telecommunications Union (ITU), and Inter-Society Digital Cinema Forum (ISDCF) committees. He chairs

the Workflow subcommittee of the ASC Technology Committee. Barton also participates in the AMPAS committees. He was a key member of DCI and helped create the digital cinema specification.



**Ron Burdett** is an experienced business and technology management executive in the entertainment industry. He received a BS degree in mechanical engineering from Bradley University. Burdett is founder and president of Sunset Digital and has worked as general manager at Technicolor and Eastman Kodak Co. He is currently a member of the ASC Technology Committee, as well as co-chair of the ASC Motion Imaging Workflow subcommittee.



**Gary Demos** has been a pioneer in the development of computer-generated images for use in motion pictures, and in digital film scanning and recording. He founded Digital Productions (1982-1986), and was awarded an AMPAS Scientific and Engineering Award in 1984 along with John Whitney Jr. "For the Practical Simulation of Motion Picture Photograph By Means of Computer-Generated Images." Demos also founded Whitney-Demos

Productions (1986-1988), DemoGraFX (1988-2003), and Image Essence LLC (in 2005).

Demos is the recipient of the AMPAS 2005 Gordon E. Sawyer Oscar for lifetime technical achievement. Since 1990, he has been exploring layered compression coding and is active in preparing for future imaging and image processing technology. Demos is involved in the ASC Technology Committee and the AMPAS ACES project. He has presented numerous papers at SMPTE, and is a SMPTE Fellow.



**Don Eklund** currently works at Verance Corp. in San Diego as vice president of business development. Prior to that he held an executive position with Sony Pictures where he helped execute the launch of DVD, UMD, and Blu-ray.



**William Feightner** graduated from California State University Fresno with B.A. degree and proceeded onto law school. After one year as a law student he was offered a summer job at Compact Video in Burbank. That part-time job led to his career in the entertainment industry. He received a technical achievement award from the Academy of Motion Picture Arts and Sciences for the creation of a Digital Color Separation process for archival of motion

pictures. Feightner has received an Emmy Award for special effects work on the television series "Moonlighting," a Technical Achievement Award from the Academy of Motion Picture Arts and Sciences and a Monitor Award for the opening segment of "The Magical World of Disney."



**Eric Rodli** has been involved in the management and development of entertainment technology since the late 1980s when he became president of Iwerks Entertainment; a pioneer in large-format film, motion simulation theaters, and other immersive technologies. He subsequently has had senior roles in a variety of entertainment and media organizations, including being a partner in the entertainment consulting practice of PwC as well as president of

Kodak's Motion Picture Division. He currently is a consultant for Laser Light Engines, a leader in providing laser illumination systems for cinema and related applications. He is an Associate Member of the ASC. Rodli received a B.A. in economics from University of California, San Diego, and an M.B.A. from the University of Chicago.



**Garrett J. Smith** is currently chief technology officer at Ha Productions, based in Santa Barbara, CA. He previously served as vice president, production technology and digital mastering operations at Paramount Pictures. During his 24-year tenure at Paramount, Smith participated in the development of DVD, HDTV, and Digital Cinema Initiatives (DCI). Prior to Paramount Pictures, he worked in various post-production positions including post-production

supervisor for "Ripley's Believe It or Not;" director, post-production for Columbia Pictures Television; and manager, film services at CBS Network Television. Smith is a member of AMPAS and serves on the Science and Technology Council. He is also an Associate Member of the ASC and an adjunct associate professor at the University of Southern California School of Cinematic Arts.



**John Scheele** is a visual effects supervisor and producer, working in CG and animation for films and television. His work includes *Blade Runner* (2007 Final Cut), *World Trade Center*, *Batman Forever*, *The Adventures of Buckaroo Banzai Across the 8th Dimension*, and *TRON* (1982). Scheele is co-chair of the Joint Technology subcommittee on Virtual Production.



**David Morin** participated in the early development of motion capture and 3D software at Softimage, as director of special projects when Softimage was part of Microsoft, and vice-president of special projects and content group when Softimage became part of Avid Technology. Morin later joined Manex Entertainment as president of the MVFX division, a visual effects house. Today Morin assists the Media & Entertainment division of Autodesk from his base

in Los Angeles. He currently chairs the Autodesk Film CTO Advisory Council, a product focus group of large studio facilities. He is also co-chair of the Virtual Production Committee.